

[FROM THE AMERICAN JOURNAL OF SCIENCE, VOL. XXV, January, 1908.]

## DESCRIPTIONS OF TERTIARY INSECTS.

By T. D. A. COCKERELL.





(1) A COLEOPTEROUS LARVA FROM THE GREEN RIVER SHALES.

THE larva here described occurs in the red shales of Green River, Wyoming, and is represented in the Yale University Museum by a good specimen, with the reverse. The name of the collector is unknown. In appearance the insect very closely resembles the larva of *Carabus truncaticollis* Fisch., well figured by Kineaid in Proc. Wash. Acad. Sci., vol. 2, pl. xxii.

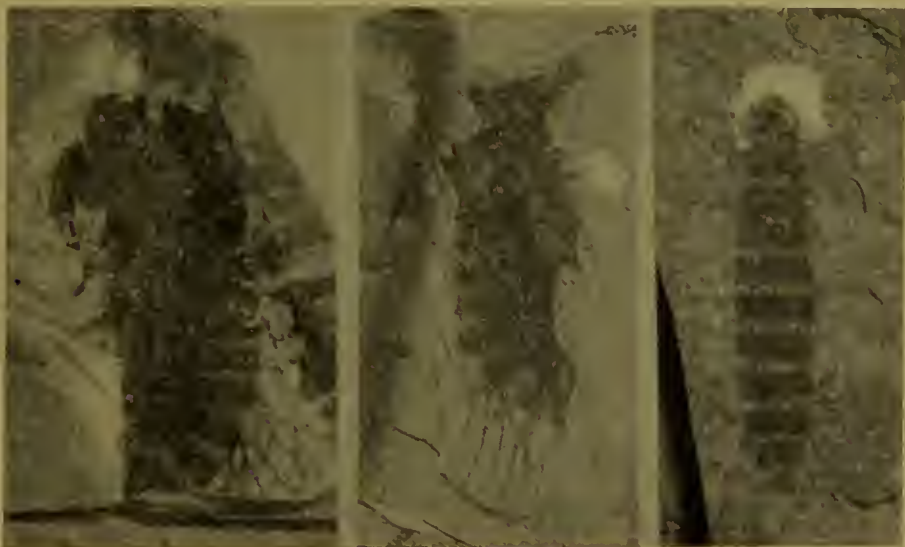
*Carabites kincaidi* sp. nov. Fig. 3.

Length about 22<sup>mm</sup>, width in the middle a trifle over 4,

1

2

3



Figs. 1, 2. *Platypedia primigenia*  $\times 2$ .  
Fig. 3. *Carabites kincaidi*  $\times 2$ .

narrowing somewhat caudally, the widest point however a little posterior to the middle; head small, about  $1\frac{2}{3}$ <sup>mm</sup> diameter; pronotum about 3<sup>mm</sup> broad and 2<sup>mm</sup> long, thus much shorter than in modern *Carabus*, and not especially differentiated from the other segments; segments formed as in *Carabus*, more than twice as broad as long, with the lateral hind margins angulate in the same manner and degree as in *C. truncaticollis*. The segments are dark, with the sections colorless, and there are indications of a median longitudinal light line. The details of the caudal end cannot be made out.

This may well be the larva of the genus *Neothanes* Scudder, described from the Green River beds; but as this cannot be demonstrated, I leave it in the blanket genus *Carabites*. It is dedicated to the writer who first described and figured the larva of an American *Carabus*.

It is to be remarked that the *Mormolucoides articulatus* Hitchcock, from the Trias of Turner's Falls, Mass., is extraordinarily like a Carabid larva, and resembles the present insect in the relatively small head and short prothorax. The lateral hind corners of the segments in the *Mormolucoides* are very much more produced, herein agreeing better with the larva of *Silpha*.

(2) A CICADA FROM FLORISSANT, COLORADO.

*Platypedia primigenia* sp. nov. Figs. 1, 2.

Length about 23<sup>mm</sup> (the apex of abdomen is lost); thorax 9<sup>mm</sup> long and 8 high (deep); compared with the living *P. putnami* Uhler, the body is larger and more robust, and the head is directed downwards, so that the frontal outline, in lateral view, is much more nearly vertical; the robust anterior legs are well preserved, and appear to be as in *P. putnami*; as in the living species, the femora are black, and the coxæ, seen from behind, pallid; length of anterior femur and coxa 4<sup>mm</sup>, of tibia 3 $\frac{1}{3}$ ; wings hyaline, with dark veins, as in the recent species, the large triangular second ulnar cell being normal for the genus. Compared with *P. putnami*, the following differences in the details of the venation are apparent:—

(1) The fourth apical cell has its inner point lower, so that the lower side of its basal end is not quite half as long as the upper.

(2) The seventh apical is narrower, its length being at least twice its breadth.

(3) The eighth apical is longer.

Florissant, Station 14 (*Wilmatte P. Cockerell*, 1907). One specimen, with reverse, in Yale University Museum.

*P. putnami* Uhler is found in Colorado to-day; a specimen before me was collected by Mr. C. DeVoss in Gregory Cañon, Boulder Co., Colorado, July, 1907.

*P. primigenia* will be easily known from *Lithocicada perita* Ckll. by the shape of the eighth apical cell, and from *Cicada grandiosa* Scudd. by the much smaller size.

ART. XXV.—*Descriptions of Tertiary Insects*; by T. D. A. COCKERELL.

PART II. [Continued from p. 52.]

(3) *A Belostomatid (Hemiptera) from Colorado.*

THE occurrence of Belostomatid bugs in the Tertiary rocks of Europe has been known ever since 1837, when Germar described *Belostoma goldfussi* from the vicinity of Bonn, in Rhenish Prussia. *Belostoma speciosum* Heer, from Ceningen, is one of the largest and finest fossil insects from that famous locality. So far as the paleontological evidence went, one might have supposed that the Belostomatids, now so characteristic of America, were in Tertiary times confined to the Old



FIG. 1.—*Zaitha vulcanica*,  $\times 2$ .

World. That this was not really the case is shown by the discovery of a small species in the Florissant Miocene.

*Zaitha vulcanica* sp. nov.

Length of body  $10^{\text{mm}}$ , not counting the thick caudal valves, which are about  $2^{\text{mm}}$  long; breadth in middle a little over  $5^{\text{mm}}$ ; shape normal; anterior femora  $4^{\text{mm}}$  long, thick, but not swollen in the middle, the anterior edge practically straight (distinctly convex in the living *Z. fluminea*), the anterior side with a distinct groove; anterior tibia + tarsus about  $3^{\text{mm}}$  long, curved as in *Z. fluminea*; hind femora distinctly incrassated in the middle; hind tibia + tarsus about  $6^{\text{mm}}$ , thus shorter proportionally than in *Z. fluminea*. General appearance quite *Nepa*-

like, but the structure is that of *Zaitha*. The apical angle of the corium appears to have been broader than in *Z. fluminea*, but the whole dorsal region is very indistinctly preserved. Florissant Station 14 (W. P. Cockerell, 1907).

(4) *A Tipulid Fly from the Green River Shales.*

The genus *Dicranomyia* Stephens is represented in the living fauna of North America by 35 described species. In the fossil state, numerous species occur in Prussian amber,



FIG. 2. — *Dicranomyia rhodolitha*,  $\times 2$ .

according to Loew. Scudder has described eight species from the Tertiary rocks of the Rocky Mountains; five being from Florissant and three from the Lower White River, at the boundary between Utah and Colorado. A new species is added from Wyoming.

*Dicranomyia rhodolitha* sp. nov.

Male. Length  $7^{\text{mm}}$ ; length of thorax  $2^{\text{mm}}$ , its width  $1\frac{1}{3}^{\text{mm}}$ ; genitalia essentially as in *D. stigmosa* Scudder. Eyes separated by an interval of about  $135\ \mu$ .

Legs long and slender; anterior femur  $4\frac{3}{5}$ , tibia  $5\frac{1}{2}$ , tarsus  $6\frac{1}{4}^{\text{mm}}$ ; middle femur  $5\frac{1}{2}$ , tibia  $6^{\text{mm}}$ ; hind femur 6, tibia  $6\frac{2}{5}^{\text{mm}}$ .

Wings  $7^{\text{mm}}$  long: a small dark spot on costa  $2\frac{3}{5}^{\text{mm}}$  from base; another  $4^{\text{mm}}$  from base; stigmal spot large, as in *D. stigmosa*. Venation not well preserved, but the subcosta (mediastinal of Loew) and the four apical veins are all quite normal.

Allied to *D. stigmosa* Scudder, but distinguished by the details of the measurements, and especially by the two costal spots.

Red shale of Green River, Wyoming, in Yale University Museum. Collector unknown. One specimen, with reverse.

(5) *A Pompilid Wasp from Florissant.*

In all, four fossil Pompilidæ have been described, three from Florissant, and one from Eningen. One or two others, not named, are said to occur in Baltic amber. The Florissant species have been referred to *Hemipogonius* (2) and *Ceropalites* (1): an additional species, now described, belongs to *Agenia*.



FIG. 3.—*Agenia saxigena*,  $\times 2$ .

*Agenia saxigena* sp. nov.

Length about  $11\frac{1}{2}^{\text{mm}}$ ; rather stout, width of abdomen about  $3\frac{1}{2}^{\text{mm}}$ ; anterior wing  $9\frac{2}{3}^{\text{mm}}$  long; body and femora black, tibiae and tarsi ferruginous; wings faintly dusky, with a dark cloud in the marginal cell and below, and another in lower basal part of first discoidal and below; venation ferruginous; antennæ more or less curled apically; legs not at all spinose; stigma fairly large; marginal cell lanceolate, ending in a point

on costa; *first discoidal cell of the same length as first submarginal*, viz. 2890  $\mu$ ; cubitus of hind wings originating about 34  $\mu$  beyond transversomedial. The following measurements are in  $\mu$ :

Greatest width of marginal cell .....	595
First submarginal on marginal .....	255
Second " " " .....	714
Third " " " .....	1020
Marginal from end of third transverso-cubital to apex .....	680
Basal nervure on first submarginal .....	340
" " " " discoidal .....	595
" " from transversomedial (basal of it) .....	680
Length of transversomedial .....	340
Lower side of first submarginal .....	2346
First transverso-cubital nervure .....	646
Second submarginal on first discoidal .....	255
" " " third " .....	612
Third " " " " " .....	561
Lower side of third submarginal beyond third discoidal .....	1105



FIG. 4.—*Embia florissantensis*,  $\times 2$ .

According to Fox's\* table the Pompilini (to which *Agenia* belongs) should have the first discoidal cell definitely longer than the first submarginal, but in some of the living forms the difference is trifling. *A. saxigena* is from Florissant, Station 14 (W. P. Cockerell, 1907).

\*Proc. Phila. Acad., 1894, p. 295.

(6) *The Second Tertiary Embiid.*

Pictet in 1854 described *Embia antiqua* from Baltic amber, and this has remained the single fossil representative of the family; *E. westwoodi* Hagen, from copal, being properly of the recent period.

An insect occurring at Florissant, having a strong general resemblance to a Termitite, proves upon careful examination to disagree in important particulars with all Termitidæ, and to agree well with the Embiidæ, to which it must be referred. It has even the peculiar streaked appearance of the wings, so characteristic of this family.

*Embia florissantensis* sp. nov.

Length  $12\frac{1}{2}$  mm; head about 2 mm; prothorax about  $1\frac{2}{3}$ ; anterior wing 11 mm long and  $3\frac{3}{4}$  broad; posterior wing just over 9 mm long, but as broad as the anterior; shape of wings normal, with the usual longitudinal bands of color, giving rather the appearance of a flower-petal with colored veins. The head is narrow-oblong, considerably narrower than in *E. (Oligotoma) michaeli*, McLachlan; prothorax unusually elongated, shorter, but not very much smaller than the head; the distinct venation consists of two parallel veins, barely separated, running along the upper part of the wing for about three-quarters its length, nearly parallel with the costa, but gradually nearing it apically, and apparently fusing at their ends; and of an oblique vein in the anal region. According to the interpretation of Melander\* the parallel veins represent the subcosta; and the oblique vein the cubitus, with its lowermost branch. The color bands, regarded as representing veins, show the media + radius, giving off two large branches above, essentially as in *E. urichi* Saussure (this Trinidad species is presumably named after Mr. Urich, the well-known naturalist of that island; hence there is no reason for perpetuating the erroneous form "*uhrichi*"), except that the branches are given off much sooner, the first about  $4\frac{2}{3}$  mm from base of wing, the second a little more than 4 mm from apex. The two lower color-bands, representing the third media and first cubitus, are also well represented. These particulars are derived from the anterior wing, but the hind wing is similar.

*Hab.*—Florissant, Station 14 (*W. P. Cockerell*, 1907). Also two from Station 13 (*S. A. Rohwer*, 1907, *W. P. Cockerell*, 1906). Melander, in giving an account of the discovery of *E. texana*, remarks that *Sapindus* and *Eysenhardtia* grew profusely in the locality where it was found. It is of interest to

\* Biol. Bull., 1903.

note that *Sapindus* was abundant at Florissant and *Eysenhardtia* also grew there.\*

(7) *A Mayfly from Florissant.*

Seven Ephemerids have been described from Baltic amber, and one from Eningen. In America, Scudder has described five nymphs and one adult from Florissant. I have examined the type of the latter (*E. casucca*) in the Museum of Comparative Zoology. A much larger form is here described: like the other, it unfortunately does not show the characters necessary for precise generic reference.



FIG. 5.—*Ephemera howarthi*,  $\times 2$ .

*Ephemera* (s. lat.) *howarthi* sp. nov.

Length of body, excluding caudal setæ,  $15^{\text{mm}}$ ; thorax about  $5^{\text{mm}}$ ; three slender caudal setæ; head transversely oval, about  $2^{\text{mm}}$  broad, eyes about  $\frac{1}{3}^{\text{mm}}$  distant on vertex; length of anterior wing  $13^{\text{mm}}$ , costa very slightly arched, subcostal vein close to costa; outer margin about  $9^{\text{mm}}$  long, distinctly convex.

Another specimen (from Sta. 13 B) is larger (anterior wing about  $14^{\text{mm}}$ ), but evidently the same species.

Florissant, Station 14 (*T. D. A. Cockerell*); also Sta. 13 B (*Geo. N. Rohrer*, 1907). I have named this species after Mr. Howarth, of Florissant, who is known even in Europe as a skillful creator of new genera and species of mayflies, of wondrous form and color, used by fishermen to lure the speckled trout.

\* *Eysenhardtia* (or *Viborquia*) *nigrostipellata* Ckll. ined. was collected at Florissant by the Princeton expedition, and is now in the British Museum. The leaflets have the blade about  $5\frac{1}{8}^{\text{mm}}$  long and  $2\frac{2}{5}$  broad, and are almost exactly as in *E. orthocarpa* (Gray) Watson. The little black pointed stipels are like those of *E. spinosa* Engelm.

ART. XXXIII.—*Descriptions of Tertiary Insects*; by  
T. D. A. COCKERELL.

PART III. [Continued from p. 232.]

(8) *Fossil Diptera of the Family Nemestrinidae*.

THE Nemestrinidae constitute a small but exceedingly interesting family of brachycerous Diptera; called by Comstock the tangle-veined flies. (The spelling Nemistrinidae, in Comstock's Manual, is a mistake.) Among the Brachycera they appear to have certain primitive characters: palpi (always?) 3-jointed; antennae with a jointed terminal appendage; wings with comparatively simple and direct veins. The last statement seems at variance with that of Sharp, who says, "the wing nervuration is perhaps the most complex found in the Diptera, there being numerous cells at the tip, almost after the fashion of Neuroptera." The apical reticulation of the wings, such as is described in the South African *Megistorhynchus*, does not occur in the fossil species examined by me, and may be supposed to be secondary to the venation proper, though perhaps suggestive of an ancestral character. Comparison is suggested with the Blepharoceridae.

That the Nemestrinids are actually of great antiquity is shown by the remarkable fossil *Prohirmoneura jurassica* Handlirsch.\* This insect was found in the Jurassic rocks of Bavaria, and if Handlirsch's interpretation of the venation is correct, it seems to suggest that Comstock's nomenclature of the veins in modern forms may need amendment. It is with hesitation that I base an argument on this little-known fossil; but in any event the discussion may serve to illuminate the readily visible characters of the later remains from the Miocene.

The figure of *Prohirmoneura* exhibits the following characters:

(1) A strong subcostal vein, extending nearly to the end of the wing, where it bends upwards and joins the costa.

(2) A radius, arising from the subcosta very near its base, running nearly parallel with it, but ending near the tip of the wing, not curving upwards at its apex.

(3) A radial sector, or second radius, parallel with and close to the radius, and not confluent with it basally,—but this last character may be considered doubtful.

(4) A media, branching in the apical field, and connected with the radial sector by two cross-veins, the first directed obliquely inwards, the other in the reverse direction.

(5) A cubitus, arising from the media not far from the base, and branching near the middle of the wing, the branches run-

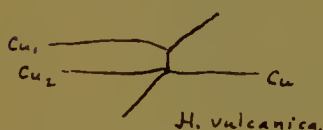
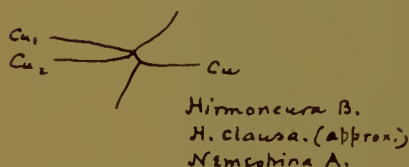
\* Die Fossilen Insekten, Part IV, 1906, p. 633, pl. li, figs. 11, 12.

ning parallel. Two cross-veins extend from the media to the hind margin, crossing the cubitus; the first crossing at its point of forking, the second (which is continuous with the second radio-medial cross-vein) far beyond.

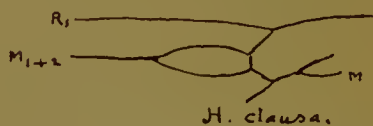
(6) Two simple anal veins, the cubital cell open.

(7) A very large alula.

This arrangement, which is not very different from that of various modern Nemestrinids, strongly suggests that the apparent cross-veins are really such, and are not to be interpreted



Branching of the cubitus.



Branching of the media.

as longitudinal veins deflected out of their course; with the exception of the cross-vein seen in modern species at the branching of the media, which is deflected M, whereas the oblique vein reaching it from  $R_s$ , and looking like a branch of the latter, is nothing but a cross-vein, which is either absent or obliterated in *Prohirmoneura*. The cubital cell is thought of as extending nearly or quite to the apex of the wing, and being twice broken by cross-veins (not branches of the cubitus), so that there are three posterior cubital cells, and two between the forks of the cubitus.

The Nemestrinids are divided into two groups,—those with, and those without, an elongate proboscis. *Palembolus florigerus* Scudder, described many years ago, from the Florissant shales, belongs to the first group: the two fossils now before me belong to the second. It is not possible that either of the latter represents *Palembolus* with the proboscis broken off or concealed, as the venation does not by any means accord with Scudder's description. I saw the type of *Palembolus* in the Museum of Comparative Zoology last summer, but, as I now much regret, I made no detailed examination of it.

The new fossils are:—

(1) *Hirnoneura melanderi* n. sp. Miocene shales of Florissant, Colorado, Station 14 (W. P. Cockerell, 1907). Length about  $15\frac{1}{2}$ mm, with the apical segments of the abdomen extended, so that the chitinous rings are separated; body black, wings hyaline, slightly dusky; width of head  $3\frac{3}{4}$ mm; of thorax 5mm; of abdomen about middle  $4\frac{1}{3}$ mm; length of wing 10mm. Named after Prof. A. L. Melander. Holotype in Yale University.

(2) *Hirnoneura vulcanica* n. sp. Miocene shales of Florissant (Mrs. Charlotte Hill). In Yale University Museum. Smaller and more slender; length about 12mm; head and thorax at least mainly black; abdomen dark brown (probably reddish in life), the hind margins of the segments having broad entire light bands, about one-third the width of the segments and extending more or less forwards at the extreme sides; a fine dark line borders the extreme hind margins; width of head and thorax each about 3mm; of abdomen about middle 4mm; wings hyaline, very faintly dusky, 11mm long. The wings are much longer in proportion to the insect than in *H. melanderi*. Holotype in Yale University Museum.

*Palembolus florigerus* is 19mm long, with wings 12mm; proboscis  $12\frac{1}{3}$ mm. In describing the venation I compare the fossils with three living species:—

(3) *Hirnoneura clausa* Osten Sacken. Texas. This is the species figured in Comstock's Manual, p. 460, as *Rynchocephalus sackeni*. I am indebted to Professor A. L. Melander for the correction.

(4) *Hirnoneura* B. A new species from Texas, of which I have the drawing of the wing, very kindly furnished by Prof. Melander.

(5) *Nemestrina* A. An undescribed species from Turkestan, of which a figure has been kindly sent by Prof. Melander. The Nemestrinids are to-day comparatively numerous in Turkestan and the adjacent regions, although so rare in North America.

The wing-characters may be best understood if taken one by one:—

(1) *Costal cross-vein* is barely beyond upper insertion of first radio-medial cross-vein in *Hirnoneura* B. and *H. melanderi*.

*deri*; a little more basad in *Nemestrina* A., and distinctly more apicad in *Hirmoneura clausa*.

(2) *Subcosta* similar in all the species of *Hirmoneura*, but ending somewhat further from the apex in *H. vulcanica* (nearly 3<sup>mm</sup> from tip of wing) and *H. clausa*; ending still further from apex in *Nemestrina* A.

(3) *Radius* (R) is practically the same in all. In *H. vulcanica* it and the subcosta are very thick veins, contrasting with the other longitudinal veins, all of which are slender.

(4) *Radial sector*, or  $R_{2+3}$ . Practically the same in all. In *H. vulcanica* it rises rapidly at the cross-vein, as shown in the figure.

(5) *Radial cell*. In all very long; the cross-nervure, which in many Diptera is very short, having become greatly elongated, and also very oblique, so that it forms more than half of the upper side of the cell. In *Nemestrina* A. and *Hirmoneura* B., as also in *Prohirmoneura*, the cell terminates at the point of origin of the second medio-cubital cross-nervure; but in *H. melanderi* it falls a little short of this, and in *H. vulcanica* and *clausa* the distance is considerable. This is shown in the accompanying figures, where the little fork on the right side of the diagram is the end of the radial cell.

(6) *Third radio-medial cross-nervure*. This nervure is absent or not preserved in *Prohirmoneura*. In *H. melanderi* it is very long, and looks like a branch of the radial sector. In the others it is oblique but much shorter, as is shown in the figures (the nervure connecting  $R_8$  with M).

(7) *Media*. In *Prohirmoneura* it simply forks; in *Nemestrina* A. it forks, but the branches are bulged outwards at the base; in *Hirmoneura* B. the upper branch has been deflected basally by the cross-nervure, so that there is a small false cross-nervure at the bifurcation; in the other species the false cross-nervure is large, as the figures show. In *H. clausa* the branches of the media meet again, enclosing a cell.

(8) *Cubitus*. The branching differs in its relation to the first cross-vein, as the figures clearly indicate, a verbal description being unnecessary. It is remarkable that in this, as well as in some features of the media, the recent species, especially *Hirmoneura* B. and *Nemestrina* A., are nearer to the *Prohirmoneura* condition than are the Florissant fossils. The apical cell between the branches of the cubitus is open in all except *H. clausa*.

(9) *Cubital cell* is just closed in *H. clausa*; in the others, narrowly open. According to my interpretation, the vein bounding it apically is a cross-nervure, and not a branch of the cubitus. If this is correct, the vein which Comstock and Needham call  $Cu_2$  in *Leptis*, *Dica*, etc., is apparently this same cross-nervure, and their  $M_3$  and  $Cu_1$  are  $Cu_1$  and  $Cu_2$ .

University of Colorado, Boulder, Colo., November 11, 1907.







IRREGULAR  
PAGE  
NUMBERS

24ColorCard CameraCray.com

